

PATENT ABSTRACTS OF JAPAN

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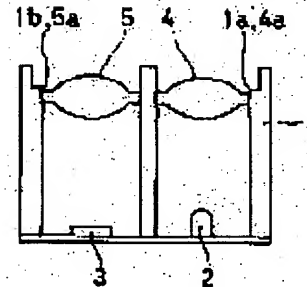
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(54) OPTICAL SENSOR

(57)Abstract:

PROBLEM TO BE SOLVED: To conduct proper detection always by setting the light spot size of reflection light and the beam width (a spot diameter) of an irradiation ray in an optical sensor detecting the existence of a person and the like.

SOLUTION: An LED(light emitting diode) 2, a condenser lens 4 which condenses light from the LED 2, a PD(photo diode) 3 receiving reflection light which is from a body to be detected and passes through the condenser lens 4, and an image focusing lens 5 which image focuses the reflection light on the PD 3 are arranged in a case 1. Thread grooves 4a, 5a are provided on the outer peripheries of the respective lens 4, 5, and simultaneously thread grooves 1a, 1b are provided on the lens hold portion of the case 1 so as to threadedly engaged with the thread grooves 4a, 5a so that positions of the LED 2 and the PD 3 against the respective lens 4, 5 can be easily adjusted.



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CLAIMS

[Claim(s)]

[Claim 1] The optical sensor characterized by to provide an accommodation means adjust the location of the lens for condensing to said light emitting device, and the location of the lens for image formation to said photo detector while having the photo detector which receives the reflected light from the detected body which passed along the lens for condensing and this lens for condensing for condensing the light from a light emitting device and this light emitting device, and the lens for image formation for carrying out image formation of that reflected light to a photo detector.

[Claim 2] An accommodation means is an optical sensor according to claim 1 characterized by consisting of a screw slot established in the lens attaching part of a case so that it might screw in the screw slot established in the periphery section of each lens, and this screw slot.

[Claim 3] It is the optical sensor according to claim 1 or 2 which a light emitting device is light emitting diode, and is characterized by a photo detector being photo diode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the optical sensor which detects existence of people, especially the optical sensor which incorporates and detects the reflected light from the detected body.

[0002]

[Description of the Prior Art] Conventionally, the thing as shown in drawing 4 is known as this kind of an optical sensor. Drawing 4 is the sectional view showing the outline configuration.

[0003] This sensor fixes LED (light emitting diode)2 and PD (photo diode)3 to the end side (pars basilaris ossis occipitalis) of the case 1 interior on both sides of a mid-feather-wall plate, and has these and composition which has arranged the lens 4 for condensing, and the lens 5 for image formation with a predetermined distance, respectively, and each lenses 4 and 5 are being fixed between the side attachment wall of a case 1, and the mid-feather-wall plate, respectively.

[0004] In the sensor of the above-mentioned configuration, the light from LED2 irradiates the detected body through a lens 4, and the light reflected with this detected body is led to PD3 through a lens 5. Therefore, the existence of the detected body is detectable by measuring the output of PD3.

[0005] Here, the height (distance between each components 2 and 3) of each above-mentioned lenses 4 and 5 cannot be adjusted, and the right and wrong as a product will be determined by the dimensional accuracy of a case 1 and lenses 4 and 5.

[0006] That is, the optical spot to PD3 by the reflected light from the detected body changes with the height of a lens 5, as shown in drawing 2, when image formation of it is carried out correctly, it becomes predetermined magnitude like the optical spot S1 of a continuous line, and while image formation is not carried out correctly and ****ing out of the focus, it will become large like the optical spot S2 of a broken line.

[0007] Moreover, as the diameter of an optical spot to the detected body which is, the beam-of-light width of face, i.e., the reflective object, of light from LED2, is also shown in drawing 3, it changes with the height of a lens 4, while it is condensed correctly and irradiating, it becomes predetermined width of face (path) like the beam of light 1L of a continuous line, and while spreading and irradiating, without being condensed correctly, it will become large like the beam of light L2 of a broken line.

[0008]

[Problem(s) to be Solved by the Invention] Since the conventional optical sensor was constituted as mentioned above and height control (focus accommodation) of a lens was not able to be performed, depending on the lens location, the optical spot of the reflected light spread, and it did not fade, the predetermined beam-of-light width of face (diameter of a spot) from which exposure light turns into parallel light was not obtained, but there was a trouble that proper detection could not be performed.

[0009] This invention was made paying attention to the above troubles, can set up correctly the magnitude of the optical spot of the reflected light, and the beam-of-light width of face (diameter of a spot) of exposure light, and aims at offering the optical sensor which can perform always proper detection.

[0010]

[Means for Solving the Problem] The optical sensor concerning this invention possesses an accommodation means adjust the location of the lens for condensing to said light emitting device, and the location of the lens for image formation to said photo detector while being equipped with the photo detector which receives the reflected light from the detected body which passed along the lens for condensing and this lens for condensing for condensing the light from a light emitting device and this light emitting device, and the lens for image formation for carrying out image formation of that reflected light to a photo detector.

[0011] Moreover, the above-mentioned accommodation means consists of a screw slot established in the lens attaching part of a case so that it may screw in the screw slot established in the periphery section of each lens, and this screw slot, and use a light emitting device as light emitting diode further, and let a photo detector be photo diode.

[0012]

[Embodiment of the Invention] Drawing 1 is the sectional view showing the outline configuration of the optical sensor concerning this invention, and the same sign as drawing 4 shows the same component.

[0013] In drawing 1, it is LED (light emitting device) and PD (photo detector) by which 1 had been arranged two and a case and 3 have been arranged at the case 1 bottom, and is mutually shaded with the mid-feather-wall plate. 4 is a lens for condensing for condensing the light from LED2, and it is constituted so that it may screw with screw slot 1a which screw slot 4a prepared in the periphery section prepared in the lens attaching part of a case 1 and the location (height) to LED2 can be adjusted. 5 is a lens for image formation for carrying out image formation of the reflected light from the detected body which passed along the lens 4 for condensing to PD3, and it is constituted so that it may screw with screw slot 1b which screw slot 5a prepared in the periphery section like the lens 4 for condensing prepared in the lens attaching part of a case 1 and the location (height) to PD3 can be ****(ed).

[0014] Drawing 2 shows the simple substance configuration of each above-mentioned lenses 4 and 5. The screw slots 4a and 5a are established in periphery enclosures other than the lens side along which light passes like illustration, and it has come to be able to perform accommodation of a height location easily. Moreover, drawing 3 is the perspective view showing the configuration of the case 1 which removed lenses 4 and 5.

[0015] Like the sensor of drawing 4, the light from LED2 is irradiated by the detected body through a lens 4, the reflected light from this detected body is led to PD3 by the optical sensor of the above-mentioned configuration through a lens 5, and the existence of the detected body is detected by the output of this PD3.

[0016] Although proper detection cannot be performed in that case unless the height of each lenses 4 and 5 is proper as mentioned above Since the accommodation means of the lens location by the screw slots 4a and 5a of lenses 4 and 5 and the screw slots 1a and 1b of the lens attaching part of the case 1 screwed in this is established in this example The magnitude of the optical spot of the reflected light and the beam-of-light width of face (diameter of a spot) of exposure light can be set up correctly easily, and always proper detection can be performed.

[0017] That is, a screw slot is in a lens side face and the case inside, the height of lenses 4 and 5 can be easily changed by the principle of a screw by easy actuation of rotating lenses 4 and 5, and the dimensional accuracy of a case 1 and lenses 4 and 5 can be amended easily. It is only dependent on the pitch of a screw slot, and this precision can raise precision if needed.

[0018]

[Effect of the Invention] Since it had a means to adjust the location of each lens to a light emitting device and a photo detector, as mentioned above according to this invention, the magnitude of the optical spot of the reflected light and the beam-of-light width of face (diameter of a spot) of exposure light can be set up correctly, and it is effective in the ability to perform always proper detection.

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TECHNICAL FIELD

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PRIOR ART

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[0007] Moreover, as the diameter of an optical spot to the detected body which is, the beam-of-light width of face, i.e., the reflective object, of light from LED2, is also shown in drawing 3, it changes with the height of a lens 4, while it is condensed correctly and irradiating, it becomes predetermined width of face (path) like the beam of light 1L of a continuous line, and while spreading and irradiating, without being condensed correctly, it will become large like the beam of light L2 of a broken line.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since the conventional optical sensor was constituted as mentioned above and height control (focus accommodation) of a lens was not able to be performed, depending on the lens location, the optical spot of the reflected light spread, and it did not fade, the predetermined beam-of-light width of face (diameter of a spot) from which exposure light turns into parallel light was not obtained, but there was a trouble that proper detection could not be performed. [0009] This invention was made paying attention to the above troubles, can set up correctly the magnitude of the optical spot of the reflected light, and the beam-of-light width of face (diameter of a spot) of exposure light, and aims at offering the optical sensor which can perform always proper detection.

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MEANS

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[Embodiment of the Invention] Drawing 1 is the sectional view showing the outline configuration of the optical sensor concerning this invention, and the same sign as drawing 4 shows the same component.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional view showing the outline configuration of the optical sensor concerning this invention

[Drawing 2] Drawing showing the configuration of each lens of drawing 1

[Drawing 3] The perspective view showing the configuration of the case of drawing 1

[Drawing 4] The outline configuration **** sectional view of the conventional optical sensor

[Drawing 5] The explanatory view showing the optical spot to PD of drawing 4

[Drawing 6] The explanatory view showing the beam of light from LED of drawing 4

[Description of Notations]

1 Case

1a Screw slot

1b Screw slot

2 LED (Light Emitting Device)

3 PD (Photo Detector)

4 Lens for Condensing

4a Screw slot

5 Lens for Image Formation

5a Screw slot

[Translation done.]

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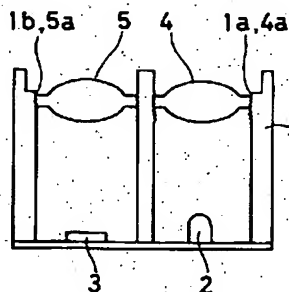
(74) 代理人 弁理士 丹羽 宏之 (外1名)

(54) 【発明の名称】 光学式センサ

(57) 【要約】

【課題】 人の存在等を検知する光学式のセンサにおいて、反射光の光スポットの大きさ及び照射光の光線幅(スポット径)を正しく設定することができ、常に適正な検知を行うことができるようにする。

【解決手段】 LED2と、このLED2からの光を集光するための集光用レンズ4と、この集光用レンズ4を通った被検知体からの反射光を受光するPD(フォトダイオード)3と、その反射光をPD3に結像させるための結像用レンズ5とをケース1内に配置する。また、各レンズ4、5の外周部にネジ溝4a、5aを設けるとともに、このネジ溝4a、5aに螺合するようにケース1のレンズ保持部にネジ溝1a、1bを設け、LED2とPD3の各々のレンズ4、5に対する位置を容易に調節できるようにする。



- 1: ケース
- 1a: ネジ溝
- 1b: ネジ溝
- 2: LED (発光素子)
- 3: PD (受光素子)
- 4: 集光用レンズ
- 4a: ネジ溝
- 5: 結像用レンズ
- 5a: ネジ溝

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【特許請求の範囲】

【請求項1】 発光素子と、この発光素子からの光を集光するための集光用レンズと、この集光用レンズを通った被検知体からの反射光を受光する受光素子と、その反射光を受光素子に結像させるための結像用レンズとを備えるとともに、前記発光素子に対する集光用レンズの位置及び前記受光素子に対する結像用レンズの位置を調節する調節手段を具備したことを特徴とする光学式センサ。

【請求項2】 調節手段は各レンズの外周部に設けたネジ溝とこのネジ溝に螺合するようにケースのレンズ保持部に設けたネジ溝とからなることを特徴とする請求項1記載の光学式センサ。

【請求項3】 発光素子は発光ダイオードであり、受光素子はフォトダイオードであることを特徴とする請求項1または2記載の光学式センサ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、例えば人の存在を検知する光学式センサ、特に被検知体からの反射光を取り込んで検知する光学式センサに関するものである。

【0002】

【従来の技術】従来、この種の光学式センサとして、例えば図4に示すようなものが知られている。図4はその概略構成を示す断面図である。

【0003】このセンサは、ケース1内部の一端側（底部）に中仕切板を挟んでLED（発光ダイオード）2とPD（フォトダイオード）3を固定し、これらと所定の距離を持ってそれぞれ集光用レンズ4と結像用レンズ5を配置した構成となっており、各レンズ4、5はそれぞれケース1の側壁と中仕切板の間に固定されている。

【0004】上記構成のセンサにおいて、LED2からの光はレンズ4を通して被検知体を照射し、この被検知体で反射した光はレンズ5を経てPD3に導かれる。したがって、PD3の出力を測定することにより被検知体の有無を検知することができる。

【0005】ここで、上記各レンズ4、5の高さ（各素子2、3との間の距離）は調節不可であり、ケース1とレンズ4、5の寸法精度によって製品としての良し悪しが決定的なことになる。

【0006】すなわち、被検知体からの反射光によるPD3への光スポットは図2に示すようにレンズ5の高さによって変わり、正しく結像されているときは実線の光スポットS1のように所定の大きさになり、正しく結像されていないときは破線の光スポットS2のように大きくなってしまふ。

【0007】また、LED2からの光の光線幅、つまり反射物である被検知体への光スポット径も図3に示すようにレンズ4の高さによって変わり、正しく集光されて照射しているときは実線の光線1Lのように所定の幅

（径）となり、正しく集光されずに広がって照射しているときは破線の光線1L'のように大きくなってしまふ。

【0008】

【発明が解決しようとする課題】従来の光学式センサは上記のように構成されており、レンズの高さ調節（ピント調節）ができないため、レンズ位置によっては反射光の光スポットが広がってボケたり、また照射光が平行光となる所定の光線幅（スポット径）が得られず、適正な検知ができないという問題点があった。

【0009】本発明は、上記のような問題点に着目してなされたもので、反射光の光スポットの大きさ及び照射光の光線幅（スポット径）を正しく設定することができ、常に適正な検知を行うことができる光学式センサを提供することを目的としている。

【0010】

【課題を解決するための手段】本発明に係る光学式センサは、発光素子と、この発光素子からの光を集光するための集光用レンズと、この集光用レンズを通った被検知体からの反射光を受光する受光素子と、その反射光を受光素子に結像させるための結像用レンズとを備えるとともに、前記発光素子に対する集光用レンズの位置及び前記受光素子に対する結像用レンズの位置を調節する調節手段を具備したものである。

【0011】また、上記の調節手段は各レンズの外周部に設けたネジ溝とこのネジ溝に螺合するようにケースのレンズ保持部に設けたネジ溝とからなり、更に発光素子は発光ダイオードとし、受光素子はフォトダイオードとしたものである。

【0012】

【発明の実施の形態】図1は本発明に係る光学式センサの概略構成を示す断面図であり、図4と同一符号は同一構成要素を示している。

【0013】図1において、1はケース、2、3はケース1の下側に配置されたLED（発光素子）、PD（受光素子）で、中仕切板によって互いに遮光されている。4はLED2からの光を集光するための集光用レンズで、外周部に設けたネジ溝4aがケース1のレンズ保持部に設けたネジ溝1aと螺合するようになっており、LED2に対する位置（高さ）が調節できるように構成されている。5は集光用レンズ4を通った被検知体からの反射光をPD3に結像するための結像用レンズで、集光用レンズ4と同様外周部に設けたネジ溝5aがケース1のレンズ保持部に設けたネジ溝1bと螺合するようになっており、PD3に対する位置（高さ）が調節できるように構成されている。

【0014】図2は上記各レンズ4、5の単体形状を示したものである。図示のように光の通るレンズ面以外の外周囲にネジ溝4a、5aが設けられており、容易に高さ位置の調節ができるようになっている。また、図3はレンズ4、5を取り外したケース1の形状を示す斜視図

である。

【0015】上記構成の光学式センサは、図4のセンサと同様、LED 2からの光がレンズ4を通して被検知体に照射され、この被検知体からの反射光がレンズ5を通してPD 3に導かれ、このPD 3の出力により被検知体の有無が検知される。

【0016】その際、前述のように各レンズ4、5の高さが適正でないと適正な検知を行うことができないが、本実施例ではレンズ4、5のネジ溝4a、5aとこれに螺合するケース1のレンズ保持部のネジ溝1a、1bによるレンズ位置の調節手段が設けられているので、容易に反射光の光スポットの大きさ及び照射光の光線幅（スポット径）を正しく設定することができ、常に適正な検知を行うことができる。

【0017】すなわち、レンズ側面とケース内側にネジ溝があり、レンズ4、5を回転させるだけの簡単な操作でネジの原理によりレンズ4、5の高さを容易に変えることができ、ケース1とレンズ4、5の寸法精度を容易に補正することができる。この精度はネジ溝のピッチに依存するだけであり、必要に応じて精度を向上させることができる。

【0018】

【発明の効果】以上のように本発明によれば、発光素子

と受光素子に対する各々のレンズの位置を調節する手段を備えたため、反射光の光スポットの大きさ及び照射光の光線幅（スポット径）を正しく設定することができ、常に適正な検知を行うことができるという効果がある。

【図面の簡単な説明】

【図1】 本発明に係る光学式センサの概略構成を示す断面図

【図2】 図1の各レンズの形状を示す図

【図3】 図1のケースの形状を示す斜視図

【図4】 従来の光学式センサの概略構成を示す断面図

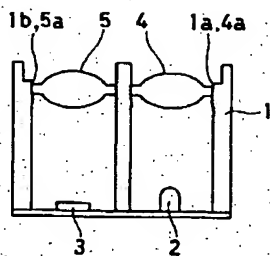
【図5】 図4のPDへの光スポットを示す説明図

【図6】 図4のLEDからの光線を示す説明図

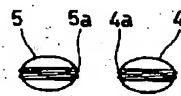
【符号の説明】

- 1 ケース
- 1a ネジ溝
- 1b ネジ溝
- 2 LED（発光素子）
- 3 PD（受光素子）
- 4 集光用レンズ
- 4a ネジ溝
- 5 結像用レンズ
- 5a ネジ溝

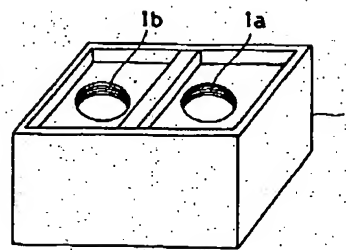
【図1】



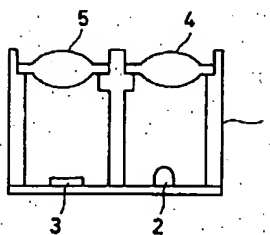
【図2】



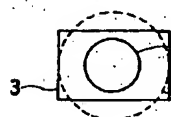
【図3】



【図4】



【図5】



【図6】

